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Application of HCMM data to regional geologic
analysis for mineral and energy resource evaluation

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June-August 1981

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Prepared for
Goddard Space Flight Center
Greenbelt, Maryland 20771

Submitted by
Kenneth Watson, Principal Investigator
U.S. Geological Survey, Denver, Colorado 80225

Prepared by
Kenneth Watson and Susanne H-Miller
U.S. Geological Survey, Denver, Colorado 80225

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TECHNICAL REPORT STANDARD TITLE PAGE

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16. Abstract It has been found that HCMM day and night images can be satisfactorily registered using an affine transformation and carefully selected control points. A method based solely on remote sensing data has been developed for thermal-inertia mapping.			
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Figure 2. Technical Report Standard Title Page

A. Problems

B. Accomplishments

(See significant results)

C. Significant Results

Registration of thermal images is complicated by distinctive differences in the appearance of day and night features needed as control in the registration process. These changes are unlike those that occur between Landsat scenes and pose unique constraints. Experimentation with several potentially promising techniques has lead to selection of a fairly simple scheme for registration of data from the experimental thermal satellite HCMM using an affine transformation.

A method based solely on remote sensing data has been developed to estimate those meteorological effects which are required for thermal-inertia mapping. It assumes that the atmospheric fluxes are spatially invariant and that the solar, sky, and sensible heat fluxes can be approximated by a simple mathematical form. Coefficients are determined from least-squares method by fitting observational data to our thermal model.

A comparison between field measurements and the model-derived flux shows the type of agreement which can be achieved. An analysis of the limitations of the method was conducted.

D. Publications and Presentations

Watson, Kenneth, Hummer-Miller, Susanne and Sawatzky, D. L., 1981, Registration of Heat Capacity Mapping Mission day and night images: Photogrammetric Engineering, in press.

Watson, Kenneth, and Hummer-Miller, Susanne, 1981, A simple algorithm to estimate the effective regional atmospheric parameters for thermal-inertia mapping: Remote Sensing of the Environment, in press.

Watson, Kenneth, June 11, 1981, Geologic applications of thermal-inertia mapping from satellite: IEEE meeting, Washington, D. C.

E. Recommendations

Rumors of the closing of the image processing facility and its capability to produce CCTs have surfaced. This would be a significant blow to any future attempts to analyze areas not currently part of any on-going investigation. This in turn would preclude later attempts to put together a US "best scenes" mosaic from thermal (day & night) and thermal inertia images.

F. Funds Expended

Total expenditures to date: \$25,000

G. Data Utility

Using the computer program that searches the HCMM catalog, we found and ordered several day-night pairs for each of the test areas. The Silver City site has only one day-night (36 hr.) pair with 10% cloudcover for the day and 0% for the night. We have also received CCTs for 31 scenes. Of these there are six days with day-night coverage which can be used for thermal-inertia mapping.